

Proposed Economic Analysis for the Renewable Electricity Standard

Introduction

The purpose of this document is to outline the economic analysis of the Renewable Electricity Standard (RES) that the Air Resources Board (ARB or Board) will be proposing in 2010. Governor Schwarzenegger's Executive Order (EO) S-21-09 directed the Board to adopt a regulation consistent with a 33% renewable electricity energy target established in EO S-14-08 by July 31, 2010. The rulemaking and the associated analysis will be completed in coordination with the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), the California Independent System Operator (CAISO), and other regulatory agencies as needed.

Economic analysis of proposed regulations for consideration by the Board is required by law. The required economic analysis for the RES includes:

- Assessment of impacts on California business creation, expansion, or elimination as a result of the proposed regulation.
- Assessment of whether the proposed regulation will create or eliminate jobs.
- Estimates of impacts on affected individuals in California.
- Determination of impacts on small businesses.
- Determination of California business competitiveness with other states.
- Assessment of the impacts to determine that activities undertaken to comply with the regulations do not disproportionately impact low-income communities.

Economic impacts of a 33% RES could occur if the cost of the regulation leads to increases in customers energy bills. The economic impact methodology will evaluate the increase in business and residential monthly bills and the effects on business creation, competitiveness and employment that may result from increased electric bills.

Plausible Compliance Scenarios

ARB, in consultation with the CPUC and CEC, will determine the baseline to which the RES implementation costs will be compared to calculate the incremental costs. The Renewable Portfolio Standard (RPS) currently in place requires electric corporations to increase procurement from eligible renewable energy resources by at least 1% of their retail sales annually, until they reach 20% by 2010. The baseline used for the economic analysis will be the 20% RPS scenario as described in the Proposed Technical Feasibility Analysis¹. That document also specifies the plausible scenarios that demonstrate likely pathways in which RES can be implemented. The economic analysis will determine the incremental economic impacts of these likely pathways compared to the baseline scenario.

¹ The Proposed Technical Feasibility Analysis can be found at <http://www.arb.ca.gov/energy/res/res.htm>.

Cost Analysis

Cost analysis will be performed for two purposes: cost-effectiveness calculations and economic impact analysis. The major tool for the cost analysis is the CPUC 33% RPS Calculator. The Calculator will be used directly to determine the cost-effectiveness of each plausible scenario, and the Calculator's cost output will be used as an input to other models to determine various economic impacts of each scenario.

Each of the scenarios' costs will be assessed using the CPUC 33% RPS Calculator². The Calculator was developed by the consulting firm Energy and Environmental Economics (E3) for the CPUC Energy Division's 33% RPS Implementation Analysis. ARB will work with E3 through the CPUC to use the Calculator. ARB will use the Calculator to estimate the incremental costs of attaining a specific sales mix of load reductions and renewable electricity by year 2020 as described in the plausible scenarios.

The RPS Calculator is a Microsoft Excel spreadsheet developed to use renewable electricity cost, resource availability, and performance data to select renewable resources needed to meet a RPS target under various scenarios. The model estimates the total cost of implementing a RPS target. The costs considered in the model are listed below:

1. Existing and new conventional generation fixed costs
2. Existing and new conventional generation variable costs
3. Existing transmission and distribution
4. New transmission for renewable resources
5. New renewable generation and integration
6. Potential cost savings from the auction of CO2 allowances by State or Federal governments

The CPUC and CEC have also joined with the CAISO to conduct more in-depth analysis of the renewable integration requirements and costs associated with each scenario. This analysis is being conducted using detailed power system simulations. These integration costs result when additional conventional generation, storage or demand response, is needed to provide supply adequacy during system peak hours (when wind energy typically provides low output), and also from the costs of rapidly adjusting the output of these other types of resources when wind and solar output is itself rapidly changing. The CAISO may also have to procure additional reserves to account for errors in forecasting renewable output during the operating day.³

The incremental cost estimates by the Calculator and CAISO analysis will feed into cost-effectiveness and economic impact analysis of the proposed RES regulation.

² The Calculator and further information are available at the CPUC web site at <http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/33implementation.htm>.

³ More details on this operational study can be found in the Proposed Technical Feasibility Analysis, or at <http://www.caiso.com/1c51/1c51c7946a480.html>.

Cost Effectiveness

Assembly Bill 32 requires the Board to consider greenhouse gas (GHG) reduction measures that are technologically feasible and cost-effective to reach the 2020 GHG reduction targets. It defines cost-effectiveness as, “the cost per unit of reduced emissions of greenhouse gases adjusted for its global warming potential.” (H&S Code 38505 (d)) This definition specifies using a metric of cost per unit of reduced emissions (e.g., dollars per metric ton CO₂e) by which the Board must express cost-effectiveness. However, it does not specify what should be included in the cost calculation. For this study, staff will use the incremental costs of achieving a 33% RES above the baseline of 20% RPS. The metric to evaluate cost-effectiveness will be in terms of dollars per ton of GHG reduction.

Economic Impact Analysis

The estimated cost of each plausible scenario will be the basis for the evaluation of a number of economic impacts of the proposed 33% RES scenarios. ARB staff will consult with the CPUC and CEC on models and data.

Business Creation, Expansion, or Elimination: Changes in fuel use, electricity rates, and business structure in the electricity sector will ripple through other California economic sectors and cause positive and negative direct and indirect impacts. Business creation, expansion or elimination is quite dependent on the impacts of the regulation on the overall economy or specific sectors. To capture and assess these impacts on businesses, ARB staff plan to use the Environmental Dynamic Revenue Analysis Model (EDRAM) of the California economy for overall macroeconomic impacts which will feed into determination of business impacts.

EDRAM is a computable general equilibrium model of California developed by Professor Peter Berck at University of California, Berkeley, and California Department of Finance. It has been used for the last two decades for economic impacts of major regulations by ARB. The model represents 120 California industrial sectors and is capable of assessing impacts on total economic activity, personal income, employment, gross state product, and several other economic indicators. These indicators would serve to describe the overall economic impacts of the proposed regulation and potential for business creation, expansion, or elimination.

ARB staff plans to assess the bill impacts on business in addition to those described in the previous paragraph. Using the CPUC rate-payer calculator, the increase in the monthly or annual cost of electricity on California businesses will be assessed. Depending on data availability, the impacts assessment would potentially disaggregate the results into regions and by rate groups of commercial, industrial, agricultural and residential.

Monthly Electric Bill Impacts on Individual and Small Business Ratepayers: The change in electric rates caused by the RES will lead to varying impacts on monthly electric utility bills for residential, commercial, and agricultural customers. For each plausible RES scenario, ARB will work with the CPUC to calculate the change in monthly bills for typical customer types:

1. **Residential Households:** An increase in electric rates will impact residential utility customers' monthly bills differently depending on energy consumption. Residential rates are tiered - customers are charged higher rates for higher levels of usage. The monthly bill impact analysis will calculate the potential increase of a low, medium and high usage customer.
2. **Low Income Residential Customers:** Low income customers qualify for rate subsidies. This analysis will evaluate bill impacts on customers enrolled in the low-income California Alternative Rates for Energy (CARE) program, and consider impacts on customers not enrolled the CARE program.
3. **Small Businesses:** Monthly bills for business customers can vary from \$100 per month to \$100,000 per month or more, depending the nature of the business' energy use. However, the percentage increase in the monthly bill remains relatively consistent within customer classes. This analysis will calculate the potential percentage increase to the monthly bills of commercial customers in different business sectors.

Employment Impacts: Estimation and description of job impacts will be based on EDRAM and employment data from various sources. The incremental cost estimates and the plausible scenarios would largely determine the job impacts. Renewable energy production is likely to create many manufacturing, construction, operation, and maintenance jobs. These jobs are known as "green jobs" in the literature. To the extent possible, in consultation with CPUC and CEC, and depending on data availability, staff will assess the impacts of the proposed regulation on "green jobs."

Small Businesses Impacts: Increases in utility bills may have an effect on small businesses' profitability. Staff will use business data from sources including data bases such as Dunn and Bradstreet to assess potential impacts on the financial profile of the small businesses affected by changes in electricity rates. The difference between the baseline and the 33% RES plausible scenarios will be calculated and used to determine the effects on monthly bills and calculate changes in revenue and profit of a typical business in several affected sectors.

California Business Competitiveness: The extent of cost impacts on the businesses operating in California and trading with other states would determine competitiveness with other states. The results of the earlier assessments would feed into competitiveness assessment and description.

In summary, ARB staff will use the CPUC's 33% RPS Calculator to calculate the incremental cost between the baseline of 20% RPS and the 33% RES plausible implementation scenarios. Additional cost estimates may be gathered from the CAISO 33% RPS operational study. The output from the Calculator will be used to determine cost effectiveness of the RES in terms of dollars per ton of GHG reduction. It will also provide inputs for other models used to determine business, employment, income, and other impacts on the California economy.